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Applicant(s): Yang, et al.

Examiner: Lee, Doris L.

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For: **A DURABLE FLAME RETARDANT FINISH
FOR CELLULOSIC MATERIALS**

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DECLARATION OF DR. JEFFREY K. STOWELL UNDER 37 C.F.R § 1.132

I, Dr. Jeffrey K. Stowell, declare and say as follows:

1. I am one of the joint inventors of the invention being claimed in the above-identified patent application.

2. I graduated from Illinois Wesleyan University in 1991 with a Bachelor of Science in chemistry. In 1996, I received a Ph.D in organic chemistry from Indiana University. While at Indiana University, I worked on the design and synthesis of novel mechanism-based enzyme inhibitors of phosphatases and phosphodiesterases for Professor Theodore Widlanski. That work resulted in several publications in prestigious journals such as the Journal of Organic Chemistry, Journal of the American Chemical Society, and Tetrahedron Letters.

3. After completing my Ph.D. at Indiana University, I joined the Phosphorus Chemicals Division Akzo Nobel in 1996 as a Research Chemist in

charge of the synthesis, application, and process development of new phosphorus-based flame retardant additives. Over the past thirteen years, I have encountered and overcome many challenging obstacles in projects ranging from the synthesis of new molecules to the process and application development of both new and existing products. During my time working with Akzo Nobel, I have been promoted for my work several times (in 1998 to Senior Research Chemist, in 2001 to Principal Research Chemist, in 2007 to Scientist). Currently, I hold the title of Scientist and manage a small group of researchers. My current work is focused on the synthesis and development of new halogen-free flame retardant products for polyurethane foam applications. I hold a plurality of U.S. patents and have authored and co-authored many technical papers.

4. I am one of the joint inventors of the invention being claimed in the above-identified application and have read and understand the Office Action mailed September 25, 2008 ("Office Action"), by the United States Patent and Trademark Office in the above-identified application and the art being applied therein, namely U.S. Pat. No. 3,639,096 to Wright ("Wright").

5. In particular, in the Office Action, the Examiner, while acknowledging that Wright fails to teach the addition of a hydroxyl-functional phosphorus ester containing at least two phosphorous atoms therein, has nevertheless concluded that it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the phosphorus ester of Fearing in the composition of Wright and the motivation to do so would have been to make the textile flame retardant.

6. The durability of flame retardant finishes is believed to be based on the covalent binding between the flame retardant additive and dimethyloldihydroxyethylene urea (DMDHEU) or melamine-formaldehyde (M-F) and that between cotton cellulose and DMDHEU or M-F. Accordingly, the presently claimed invention as amended, relates to a composition comprising a

hydroxyl-functional phosphorus ester containing at least two phosphorus atoms therein, a melamine-formaldehyde resin, one or more N-methylol functional resin(s), and a curing catalyst for treating a cellulosic material, which imparts a durable flame retardant finish on cellulosic materials by promoting binding between the flame retardant additive and DMDHEU or M-F and that between cotton cellulose and DMDHEU or M-F.

7. Wright describes a process of treating direct dyed cellulosic textiles with combined melamine formaldehyde and DMDHEU resin systems on cotton to create wrinkle resistant (a.k.a. durable press) finishes that are resistant to degradative effects of retained chlorine.

8. The mechanism for chemical modification of cotton by melamine formaldehyde and DMDHEU type resins to produce a wrinkle-resistant or durable press finish are well known in the art. See, for example, The American Cotton Handbook, Volume II, 3rd Edition; edited by Dame S. Hamby; Interscience Publishers; Chapter 23, pp. 991-1035, attached hereto as Exhibit A. As described in Chapter 23 of The American Cotton Handbook, wrinkle-resistant finishes assume their wrinkle-resistant properties as a result of the resin's ability to cross-link hydroxyl groups located on different parts of the cotton fibers. Specifically, this is accomplished by cross-linking between the melamine formaldehyde and DMDHEU to the hydroxyl groups on the cotton fabric, thereby preventing wrinkles.

9. Notably, the durability of hydroxyl-functional flame retardants, including hydroxyl-functional flame retardants of the present invention, are dependent on reacting the same resin molecule to cross-link it to a cotton hydroxyl group. Therefore, if hydroxyl functional flame retardant phosphorus ester containing at least two phosphorus atoms therein were introduced to the composition in Wright, it would compete with the hydroxyl groups on the fabric, which prevents cross-linking between the melamine

formaldehyde and DMDHEU to the hydroxyl groups on the cotton fabric. In that cross-linking between the melamine formaldehyde and DMDHEU to the hydroxyl groups on the cotton fabric is critical to preventing wrinkles in fabric, reacting a hydroxyl functional flame retardant phosphorus ester containing at least two phosphorus atoms therein with the composition in Wright would hence severely degrade any wrinkle resistant properties normally observed. In essence destroying the inventive objective of Wright.

10. Accordingly, as one skilled in the art having reviewed Wright, I would understand that the addition of a hydroxyl-functional phosphorus ester containing at least two phosphorous atoms therein to the finishing system in Wright would render Wright unsatisfactory for its intended purpose. Indeed, the addition of a hydroxyl-functional phosphorus ester containing at least two phosphorous atoms therein to composition in Wright would cause the hydroxyl-functional phosphorus ester containing at least two phosphorous atoms therein to cross-link with cotton hydroxyl groups, rather than promoting cross-linking between the melamine formaldehyde and DMDHEU to the hydroxyl groups on the cotton fabric hydroxyl groups located on different parts of the cotton fibers. In that wrinkle-resistant finishes are given their properties by promoting cross-linking between the melamine formaldehyde and DMDHEU to the hydroxyl groups on the cotton fabric hydroxyl groups located on different parts of the cotton fiber, adding a hydroxyl-functional phosphorus ester containing at least two phosphorous atoms therein would not produce a finish possessing the desired wrinkle-resistant properties.

11. Accordingly, there would be no reason to combine the phosphorus ester of Fearing with the system of Wright, because to do so would not produce a finish that is wrinkle-resistant, which is the intended purpose of Wright. Indeed, modifying Wright to add hydroxyl-functional phosphorus esters containing at least two phosphorus atoms therein would render Wright unsatisfactory for its intended purpose.

12. All statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true; and further these statements are made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and such willful false statement may jeopardize the validity of the application or any patent issued thereon.

12/18/08
Date

Jeffrey K. Stowell
Dr. Jeffrey K. Stowell